

Please provide the following information, and submit to the NOAA DM Plan Repository.

Reference to Master DM Plan (if applicable)

As stated in Section IV, Requirement 1.3, DM Plans may be hierarchical. If this DM Plan inherits provisions from a higher-level DM Plan already submitted to the Repository, then this more-specific Plan only needs to provide information that differs from what was provided in the Master DM Plan.

URL of higher-level DM Plan (if any) as submitted to DM Plan Repository:

1. General Description of Data to be Managed**1.1. Name of the Data, data collection Project, or data-producing Program:**

Seafloor substrate (hard and soft bottom) maps derived from satellite imagery for the islands and atolls of the Pacific Remote Island Areas

1.2. Summary description of the data:

Seafloor substrate (i.e., hard vs. soft bottom) from 0 to up to 30 m depths around islands/atolls in Pacific Remote Island Areas produced by the NOAA Ecosystem Sciences Division (ESD). The islands/atolls include Howland, Baker, Jarvis, Kingman Reef, Palmyra Atoll, Johnston Atoll, Wake Atoll. This is a preliminary product derived from an unsupervised classification of depth-invariant indices prepared from high resolution satellite images. Unsupervised classification segmented the indices into multiple classes, and the binary substrate map was produced by mapping interpreter's informed judgments in attributing the predicted classes. Where required, area-specific class attribution and minor manual editing were undertaken to remove inaccurate predictions.

1.3. Is this a one-time data collection, or an ongoing series of measurements?

One-time data collection

1.4. Actual or planned temporal coverage of the data:

2011 to 2017

1.5. Actual or planned geographic coverage of the data:

W: -176.7, E: -159.8, N: 16.75, S: -0.7

Johnston Atoll, Baker Island, Howland Island, Jarvis Island, Kingman Reef, and Palmyra Atoll in Pacific Remote Island Areas. The geographic extent of Johnston Atoll (to the North), Howland and Baker (to the West), and Jarvis Island (to the South and East).

W: 166.583, E: 166.667, N: 19.333, S: 19.2583

The geographic extent of Wake Atoll

1.6. Type(s) of data:

(e.g., digital numeric data, imagery, photographs, video, audio, database, tabular data, etc.)

Map (digital)

1.7. Data collection method(s):

(e.g., satellite, airplane, unmanned aerial system, radar, weather station, moored buoy, research vessel, autonomous underwater vehicle, animal tagging, manual surveys, enforcement activities, numerical model, etc.)

Instrument: Not applicable

Platform: Not applicable

Physical Collection / Fishing Gear: Not applicable

1.8. If data are from a NOAA Observing System of Record, indicate name of system:**1.8.1. If data are from another observing system, please specify:****2. Point of Contact for this Data Management Plan (author or maintainer)****2.1. Name:**

Annette M DesRochers

2.2. Title:

Metadata Contact

2.3. Affiliation or facility:**2.4. E-mail address:**

annette.desrochers@noaa.gov

2.5. Phone number:

(808)725-5461

3. Responsible Party for Data Management

Program Managers, or their designee, shall be responsible for assuring the proper management of the data produced by their Program. Please indicate the responsible party below.

3.1. Name:

Tomoko S Acoba

3.2. Title:

Data Steward

4. Resources

Programs must identify resources within their own budget for managing the data they produce.

4.1. Have resources for management of these data been identified?

Yes

4.2. Approximate percentage of the budget for these data devoted to data management (specify percentage or "unknown"):

Unknown

5. Data Lineage and Quality

NOAA has issued Information Quality Guidelines for ensuring and maximizing the quality, objectivity, utility, and integrity of information which it disseminates.

5.1. Processing workflow of the data from collection or acquisition to making it publicly accessible

(describe or provide URL of description):

Lineage Statement:

Satellite images were processed for the Pacific Remote Island Areas using the method described in Mumby and Edwards (2000) and then, unsupervised classification was applied to derive Hard and Soft substrates. ENVI 5.3 (Harris Geospatial Solutions, Inc.) and ArcGIS 10.5.1 (Esri, Inc.) The lineage describes the general processing steps. The detailed steps and coefficients for each place are described in the readme file in the zip file.

Process Steps:

- Worldview 2 or Worldview 3 satellite images are acquired through the NEXTVIEW Imagery License Agreement between DigitalGlobe, Inc. and National Geospatial Intelligence Agency (NGA). Under the agreement, the images are available for the use by the U.S. Government. Standard product level (2A) of multispectral and panchromatic images were acquired to produce hard soft maps. The images meeting the following criteria are carefully selected : cloud and shadow free, relatively small surf breaks, little sunglint on the water surface and little turbidity in the water.
- The satellite images were preprocessed before generating the depth invariant indices using the tools available in ENVI 5.3. The images were first orthorectified using the RPC Orthorectification Workflow tool. The images are then radiometrically corrected and converted into the radiance using the Radiometric Calibration tool and Apply Gain and Offset tool. Radiometric calibration factors for each image are provided by DigitalGlobe in the associated metadata. The absolute calibration factors are available in the online documentation made available by DigitalGlobe. (Citation: Absolute Radiometric Calibration: 2016v0)
- The atmospheric correction steps described in Mumby and Edwards (2000) were applied to the radiance images remove some of the atmospheric influences on the images. The calculation is sequenced in ENVI 5.3/IDL 8.5. (Citation: Mumby, P. J., Edwards, A. J. Water column correction techniques. In Remote Sensing Handbook for Tropical Coastal Management. Green, E. P., Mumby, P. J., Edwards, A. J., Clark, C. D., Eds. UNESCO: Parisk, France, 2000. Pp. 121-128.)
- Depth Invariant Index in Mumby and Edwards (2000) were derived for 10 band pairs of each image. The band pairs are: Coastal - Blue, Coastal - Green, Coastal - Yellow, Coastal - Red, Blue - Green, Blue - Yellow, Blue - Red, Green - Yellow, Green - Red, Yellow - Red. Following equation was applied to each band pair using the Band Math tool in ENVI 5.3 to derive the Depth Invariant Index. Depth Invariant

Index of band pair i and $j = Li - [(ki/kj) * Lj]$ where Li = Radiance or Reflectance values of band i Lj = Radiance or Reflectance values of band j ki/kj = Ratio of attenuation coefficients of band i and j Ratio of attenuation coefficients were derived in Excel spreadsheet using the variance and covariance of the radiance values extracted over shallow and deep sandy bottoms of each image. The results were exported as GeoTiff for the further analysis in ArcGIS. (Citation: Mumby, P. J., Edwards, A. J. Water column correction techniques. In Remote Sensing Handbook for Tropical Coastal Management. Green, E. P., Mumby, P. J., Edwards, A. J., Clark, C. D., Eds. UNESCO: Paris, France, 2000. Pp. 121-128.)

- The ISO Cluster Unsupervised Classification tool in ArcGIS 10.5.1 was employed to segment the depth invariant indices into multiple classes. Number of iterations were set to be 5, and minimum class size were set to be 3. Up to 15 classes were generated for each band pair of the depth invariant index. (Citation: Dove, D., Acoba, T., DesRochers, A. Seafloor Substrate Characterization from Shallow Reefs to the Abyss: Spatially-continuous seafloor mapping using multispectral satellite imagery, and multibeam bathymetry and backscatter data within the Pacific Remote Islands Marine National Monument and the Main Hawaiian Islands. 2018. PIFSC Internal Report IR-18-08. Issued 18 October 2018.)

- Each band pair classification was visually examined by inspecting the cluster results against the substrate boundaries that can be identified in the original satellite images. The best band pair classification result detecting the substrate boundaries was chosen, and interpreters made an informed judgement in attributing the predicted classes into hard and soft. Where required, area-specific class attribution and minor manual editing were undertaken to remove inaccurate predictions in ArcGIS 10.5.1. Output file type is GeoTIFF. (Citation: Dove, D., Acoba, T., DesRochers, A. Seafloor Substrate Characterization from Shallow Reefs to the Abyss: Spatially-continuous seafloor mapping using multispectral satellite imagery, and multibeam bathymetry and backscatter data within the Pacific Remote Islands Marine National Monument and the Main Hawaiian Islands. 2018. PIFSC Internal Report IR-18-08. Issued 18 October 2018.)

- Where multiple images are available, the same steps are applied to the second image, and the gaps of the classification result in the first image will be filled with the second image.

5.1.1. If data at different stages of the workflow, or products derived from these data, are subject to a separate data management plan, provide reference to other plan:

5.2. Quality control procedures employed (describe or provide URL of description):

The method was developed initially for an area in West Hawaii where multiple sources of accurate, reliable data were available. Applying the method to islands in the Pacific Remote Island Areas, the process and resulting classifications were quality controlled by a group of team members before the products were finalized.

6. Data Documentation

The EDMC Data Documentation Procedural Directive requires that NOAA data be well documented, specifies the use of ISO 19115 and related standards for documentation of new data, and provides links to resources and tools for metadata creation and validation.

6.1. Does metadata comply with EDMC Data Documentation directive?

Yes

6.1.1. If metadata are non-existent or non-compliant, please explain:

6.2. Name of organization or facility providing metadata hosting:

NMFS Office of Science and Technology

6.2.1. If service is needed for metadata hosting, please indicate:

6.3. URL of metadata folder or data catalog, if known:

<https://www.fisheries.noaa.gov/inport/item/54217>

6.4. Process for producing and maintaining metadata

(describe or provide URL of description):

Metadata produced and maintained in accordance with the NOAA Data Documentation Procedural Directive: https://nosc.noaa.gov/EDMC/DAARWG/docs/EDMC_PD-Data_Documentation_v1.pdf

7. Data Access

NAO 212-15 states that access to environmental data may only be restricted when distribution is explicitly limited by law, regulation, policy (such as those applicable to personally identifiable information or protected critical infrastructure information or proprietary trade information) or by security requirements. The EDMC Data Access Procedural Directive contains specific guidance, recommends the use of open-standard, interoperable, non-proprietary web services, provides information about resources and tools to enable data access, and includes a Waiver to be submitted to justify any approach other than full, unrestricted public access.

7.1. Do these data comply with the Data Access directive?

Yes

7.1.1. If the data are not to be made available to the public at all, or with limitations, has a Waiver (Appendix A of Data Access directive) been filed?

7.1.2. If there are limitations to public data access, describe how data are protected from unauthorized access or disclosure:

7.2. Name of organization of facility providing data access:

Pacific Islands Fisheries Science Center (PIFSC)

7.2.1. If data hosting service is needed, please indicate:**7.2.2. URL of data access service, if known:**

ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/bak_wv_2m_hardsoft.zip
ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/how_wv_2m_hardsoft.zip
ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/jar_wv_2m_hardsoft.zip
ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/joh_wv_2m_hardsoft.zip
ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/kin_wv_2m_hardsoft.zip
ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/pal_wv_2m_hardsoft.zip
ftp://ftp.soest.hawaii.edu/pibhmc/website/data/pria/benthichabitatlayers/wak_wv_2m_hardsoft.zip

7.3. Data access methods or services offered:

Data can be accessed online via the Pacific Islands Benthic Habitat Mapping Center website via the FTP link provided in the distribution section.

7.4. Approximate delay between data collection and dissemination:

Unknown

7.4.1. If delay is longer than latency of automated processing, indicate under what authority data access is delayed:**8. Data Preservation and Protection**

The NOAA Procedure for Scientific Records Appraisal and Archive Approval describes how to identify, appraise and decide what scientific records are to be preserved in a NOAA archive.

8.1. Actual or planned long-term data archive location:

(Specify NCEI-MD, NCEI-CO, NCEI-NC, NCEI-MS, World Data Center (WDC) facility, Other, To Be Determined, Unable to Archive, or No Archiving Intended)

Other

8.1.1. If World Data Center or Other, specify:

Pacific Islands Benthic Habitat Mapping Center

8.1.2. If To Be Determined, Unable to Archive or No Archiving Intended, explain:**8.2. Data storage facility prior to being sent to an archive facility (if any):**

Pacific Islands Fisheries Science Center - Honolulu, HI

8.3. Approximate delay between data collection and submission to an archive facility:

Unknown

8.4. How will the data be protected from accidental or malicious modification or deletion prior to receipt by the archive?

Discuss data back-up, disaster recovery/contingency planning, and off-site data storage relevant to the data collection

University of Hawaii School of Ocean and Earth Science and Technology, NOAA IRC and

NOAA Fisheries ITS resources and assets.

9. Additional Line Office or Staff Office Questions

Line and Staff Offices may extend this template by inserting additional questions in this section.